

## CLAIMS

### What is claimed is:

1. An acoustic and vibration sensor comprising:

a first electrically charged layer having a contact side and an intermediate side;

a second electrically charged layer having a contact side and an intermediate side;

a compliant intermediate electrically insulating layer disposed between and contacting the intermediate sides of the first and second electrically charged layers;

a first contact layer disposed on the contact side of the first electrically charged layer; and

a second contact layer having at least one sensing element disposed on the contact side of the second electrically charged layer,

wherein the at least one sensing element and layers of the device move with respect to each other in response to acoustic or vibrational waves intercepted by the sensor, said movement creating an output voltage corresponding to said acoustic or vibrational waves.

2. The sensor of claim 1, wherein the layers comprising the sensor are optically transparent to provide an optically transparent sensor.

3. The sensor of claim 1, wherein the first contact layer comprises at least one sensing element.

4. The sensor of claim 1, further comprising a backing layer disposed on the first contact layer.

5. The sensor of claim 2, further comprising a backing layer disposed on the first contact layer wherein the backing layer comprises a computer video screen.

6. The sensor of claim 2, further comprising a backing layer disposed on the first contact layer wherein the backing layer comprises a window.

7. The sensor of claim 4, wherein the backing layer comprises a wall.

8. The sensor of claim 4, wherein the backing layer comprises a surface of a structure.

9. The sensor of claim 1, wherein one or both of the contact layers can be patterned by a subtractive process to form sensing elements.

10. The sensor of claim 1, wherein one or both of the contact layers can be patterned by an additive process to form sensing elements.

11. The sensor of claim 1, wherein the intermediate layer comprises a gel.

12. The sensor of claim 1, wherein the intermediate layer comprises a composite material.

13. The sensor of claim 12, wherein the composite material further comprises a plurality of hollow polymer microspheres.

14. The sensor of claim 1, wherein at least one of the layers of the sensor is electrically polarized.

15. The sensor of claim 2, further comprising a plurality of sensing elements on the second contact layer forming a directional microphone array.

16. The sensor of claim 15, wherein directional characteristics of the sensor are adjustable by circuitry connected to the plurality of sensing elements.

17. The sensor of claim 1, wherein the length of the sensor exceeds the wavelength of the sound or vibration sensed such that the sensor comprises a large aperture sensor.

18. A method of sensing sound at a video monitor comprising:

providing a sensor having transparent layers and at least transparent one sensing element;

positioning the sensor on the transparent surface so that light emitted from the video monitor is transmitted through the sensor;

intercepting sound waves directed toward the transparent surface with the sensor;

allowing the sound waves to interact with the transparent layers and the at least one transparent sensing element; and

generating a voltage in response to interaction of the sound waves with the transparent layers and the at least one transparent sensing element, said voltage corresponding to the sound waves.

19. The method of claim 18, wherein the sensor includes a plurality of sensing elements and the method further comprises modifying directive characteristics of the sensor using control circuitry attached to a plurality of sensing elements located in the sensor.

20. A method of manufacturing a large aperture acoustic and vibration sensor comprising:

providing a first roll containing a first layer;

providing a second roll containing a second layer;

co-processing the first layer and the second layer from the first roll and the second roll;

sandwiching an intermediate layer between the first layer and the second layer to join the first layer, the intermediate layer, and the second layer together; and

applying contacts on the first layer and the second layer.

21. The method of claim 20, wherein the step of sandwiching the first and second layers comprises co-rolling the first and second layers to extrude the intermediate layer.

22. The method of claim 20, further comprising precoating the intermediate layer onto one of the first or second layers prior to co-processing the layers.

23. The method of claim 20, further comprising patterning the contacts to provide discrete sensing elements.

24. The method of claim 20, further comprising imparting an electrical charge on the first layer and second layers prior to co-processing the layers from the rolls.

25. The method of claim 20, further comprising imparting an electrical charge on the first layer and second layers after co-processing the layers from the rolls.

26. The method of claim 20, further comprising imparting an electrical charge on the intermediate layer prior to co-processing.

27. The method of claim 20, further comprising segmenting the sandwiched layers into large aperture sensors prior to applying contacts.

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